REMARKS

Claim 21 stands rejected under 35 U.S.C. § 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventors, at the time the application was filed, had possession of the claimed invention. Particularly, the Examiner states that the limitation of "a thickness sufficient to permit nucleation that forms nanometer size metal particles and small enough to prevent formation of a continuous metal layer" has no positive support in the specification. Applicants respectfully traverse the rejection.

Page 3, lines 4-7, for example, describes formation of a sufficiently thin layer to form a discontinuous film. Page 5, lines 10-12, describes, among other things, formation of metal structures with ~10 nm characteristic lateral dimensions. Page 7, line 28 – page 8, line 12 describe, among other things, formation of nanometer sized islands and the importance of a thin discontinuous layer of metal for Si etching. Applicants submit that these portions of the specification at least provide support for the feature of a thickness sufficient to permit nucleation that forms nanometer size metal particles and small enough to prevent formation of a continuous metal layer.

However, if positive support is still believed to be lacking, Applicants propose amending the specification to incorporate language describing this feature. As the originally-filed application (claim 21, for example) clearly

discloses the subject matter (verbatim), Applicants submit that this addition to the specification would not introduce new matter.

Claims 1 and 11 stand rejected under 35 U.S.C. § 112, second paragraph, as being indefinite. Particularly, the Examiner states that in line 3 of claims 1 and 11, the language of "a thin discontinuous layer of metal" is vague and indefinite because the term "discontinuous layer of metal" is not defined in the specification. Applicants respectfully traverse the rejection, and submit that one skilled in the art would understand the meaning of the term "discontinuous" as used in the present specification and claims. For example, Webster's Collegiate Dictionary defines "discontinuous" as "not continuous; discrete; lacking sequence or coherence." In the present specification, a discontinuous layer of (metal) film is described as film that allows access of etchant species to the silicon surface in the area of the deposited metal (page 3, lines 5-7) and allows the layer to form islands, preferably of nanometer size. This type of film would be understood by one skilled in the art as "discontinuous". Applicants thus respectfully traverse and request withdrawal of the rejection.

Claims 1-2, 4, 5, and 10 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Winton in view of Bohara. Applicants respectfully traverse the rejection as neither Winton nor Bohara, alone or in combination, disclose or suggest at least the step of forming porous silicon by etching a Si surface having a thin discontinuous metal layer in a HF and oxidant solution.

Independent claims 1 and 21 have been amended to more clearly define, among other things, the step of forming porous silicon by etching a Si surface having a thin discontinuous metal layer. Applicants submit that the references cited do not show or suggest at least this feature.

Winton is directed to a method for forming an electrical contact on an already formed porous silicon structure. The primary stated goal of Winton is maximizing contact surface area between an electrical contact layer and interstitial spaces in porous silicon. Accordingly, the reference discloses the steps of exposing a silicon substrate to an unbiased etching solution to form a porous silicon; and, next, forming an electrically conductive contact structure in the (already formed) interstitial spaces (Winton, col. 2, lines 21-36). The porous silicon formation steps are detailed in col. 3, line 39 – col. 4, line 4. Nothing in this formation description suggests depositing a thin discontinuous layer of metal on an Si surface during or before this process. In fact, col. 4, lines 5-10 of Winton describes that the samples formed as a result of the procedure described in col. 3, line 39 – col. 4, line 4 are examined, and demonstrate luminescence, before any step of metal deposition takes place. Please also see claims 1 and 16 of Winton (defining a step of stain etching "to form a porous region having interstitial spaces" before forming the contact structure). Furthermore, the conductive layer formation step is broadly described in col. 4, line 65 – col. 5, line 10 as "using techniques well established in the art of semiconductor processing", and contains no mention or suggestion that this step is employed in porous silicon formation.

In other words, Winton clearly teaches away from at least the feature of forming porous silicon by etching a Si surface having a discontinuous layer of metal in a HF and oxidant solution.

Bohara is directed to forming a platinum thermometer. To make its thermometer, Bohara teaches depositing a liftoff layer onto a substrate. This liftoff layer is made of a material such as silicon dioxide, which is substantially inert with respect to platinum (col. 5, lines 53-56). Possible substrates are non-conductive materials that are substantially inert with respect to platinum. After the liftoff medium is deposited (FIG. 2B), a photoresist is applied (FIG. 2C) and the liftoff pattern is created (FIG. 2D). The photoresist is removed (FIG. 2E), and platinum is sputter-deposited over the liftoff pattern (FIG. 2F). The platinum forms porous, interconnecting sections along the side surfaces of the liftoff pattern (col. 8, lines 59-65). Due to the porous platinum bands, a liquid etchant penetrates the platinum and removes the remainder of the silicon dioxide liftoff medium (col. 9, lines 10-15).

The use of a liftoff layer in Bohara is to remove impurities of the platinum and prevent the loss of definition of the platinum. It is not directed to formation of porous silicon; instead, the silicon dioxide liftoff layer is used to produce the patterned platinum. The invention of present claim 1 defines deposition of discontinuous metal in a step of producing porous silicon. The invention of Bohara, by contrast, teaches using a silicon dioxide liftoff layer to produce porous platinum (col. 8, lines 59-62).

The Office Action states that one skilled in the art would have found it obvious to modify the step in Winton of forming a metal layer on a Si surface, "since Winton is concerned with a method of making porous silicon by etching a silicon/Si surface formed under a metal layer using HF solution". Applicants respectfully submit that this statement is incorrect for at least the reason that Winton is not directed to a method of making porous silicon by etching a silicon/Si surface formed under a metal layer. This statement incorrectly reverses the order of events specifically taught (and claimed) in Winton, as it suggests that the metal is deposited before etching. Instead, Winton specifically teaches forming porous silicon and subsequently forming a metal layer on the etched porous silicon. In other words, by the time the metal layer is formed, the porous silicon has already been completed. There is no disclosure in Winton of etching a silicon surface that is formed under a metal layer. Amended claim 1, on the other hand, defines etching a Si layer having a discontinuous layer of metal.

Furthermore, Winton and Bohara are directed to two completely different goals. Winton is directed to forming porous silicon, which is then coated with a contact. Bohara is directed to forming a pattern of a material such as platinum, and uses silicon dioxide only as a liftoff material. The fact that Bohara may produce a pattern of silicon dioxide at a point in its platinum pattern formation does not provide any suggestion of forming porous silicon; by contrast, it provides a teaching of removing silicon dioxide after forming a porous (yet interconnecting) layer of platinum. Because the porous silicon of Winton is

already completed before forming the contact, there would be no motivation to include the teaching of Bohara cited in the Office Action to produce porous silicon, especially considering that Winton does not teach any method of forming porous silicon.

Additionally, the primary purpose of Winton, as stated above, is to increase surface area between the porous silicon and an electrical contact. Please see, for example, FIG. 3 of Winton showing conductive layer 56 filling voids between islands 61 in the porous region 52. This appears to teach away from the use of a discontinuous metal layer, as a porous metal layer would decrease surface area for contact.

For at least these reasons, Applicants respectfully submit that independent claim 1 as amended, and its dependent claims 2-10, are allowable over the references of record, including Winton and Bohara. Applicants thus request reconsideration and withdrawal of the rejection.

Claim 3 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Winton in view of Bohara and further in view of Russell. Applicants respectfully traverse and request reconsideration and withdrawal of the rejection for at least the reasons as stated above as applied to claim 1, and for at least the additional reason that Russell does not appear to remedy the deficiencies of Winton and Russell regarding claim 3.

Claims 6 and 7 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Winton in view of Bohara and further in view of Yoshikawa.

Applicants respectfully traverse and request reconsideration and withdrawal of the rejection for at least the reasons as stated above as applied to claim 1, and for at least the additional reason that Yoshikawa does not appear to remedy the deficiencies of Winton and Russell regarding claims 6 and 7.

Claim 8 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Winton in view of Bohara and further in view of Hwang. Applicants respectfully traverse and request reconsideration and withdrawal of the rejection for at least the reasons as stated above as applied to claim 1, and for at least the additional reason that Hwang does not appear to remedy the deficiencies of Winton and Russell regarding claim 8.

Claim 9 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Winton in view of Bohara and further in view of Yoshikawa. Applicants respectfully traverse and request reconsideration and withdrawal of the rejection for at least the reasons as stated above as applied to claim 1, and for at least the additional reason that Yoshikawa does not appear to remedy the deficiencies of Winton and Russell regarding claim 9.

Claim 21 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Winton in view of Bohara. Applicants have amended claim 21 to more clearly define, among other features, forming porous silicon by etching the Si surface having the discontinuous metal layer in a HF and oxidant solution. Applicants respectfully submit that Winton and Bohara, alone or in combination,

fail to teach or suggest at least this feature, at least for similar reasons as stated above regarding amended claim 1.

The Examiner indicates that claim 11 would be allowable if rewritten to overcome the 35 U.S.C. § 112, second paragraph, rejection. Applicants submit that claim 11 is allowable in its current form for at least the reasons provided above. Claims 12-20 are indicated to be allowable if rewritten in independent form. Applicants acknowledge and appreciate the Examiner's statements. As independent claim 11 is believed to be allowable in its current form, Applicants respectfully submit that dependent claims 12-20 are allowable in their current form. Applicants thus request allowance of claims 11-20.

For at least the foregoing reasons, Applicants believe that this case is in condition for allowance, which is respectfully requested. The Examiner should call Applicants' attorney if an interview would expedite prosecution.

Respectfully submitted,

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